

## **EXHIBIT A**

US008346894B2

(12) **United States Patent**  
**Arunachalam**(10) **Patent No.:** **US 8,346,894 B2**  
(45) **Date of Patent:** **Jan. 1, 2013**(54) **REAL-TIME WEB TRANSACTIONS FROM  
WEB APPLICATIONS**(76) Inventor: **Lakshmi Arunachalam**, Menlo Park,  
CA (US)(\*) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 0 days.(21) Appl. No.: **12/628,066**(22) Filed: **Nov. 30, 2009**(65) **Prior Publication Data**

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filed on Feb. 23, 2001, now Pat. No. 7,340,506, which  
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Apr. 21, 1999, now Pat. No. 6,212,556, which is a  
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filed on Jun. 20, 1997, now Pat. No. 5,987,500, which  
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Aug. 5, 1996, now Pat. No. 5,778,178.(60) Provisional application No. 60/006,634, filed on Nov.  
13, 1995.(51) **Int. Cl.**  
**G06F 13/00** (2006.01)(52) **U.S. Cl.** ..... **709/219**; 709/225; 719/329(58) **Field of Classification Search** ..... 709/217,  
709/219, 223, 225; 719/328, 329  
See application file for complete search history.(56) **References Cited****U.S. PATENT DOCUMENTS**4,829,372 A 5/1989 McCalley et al.  
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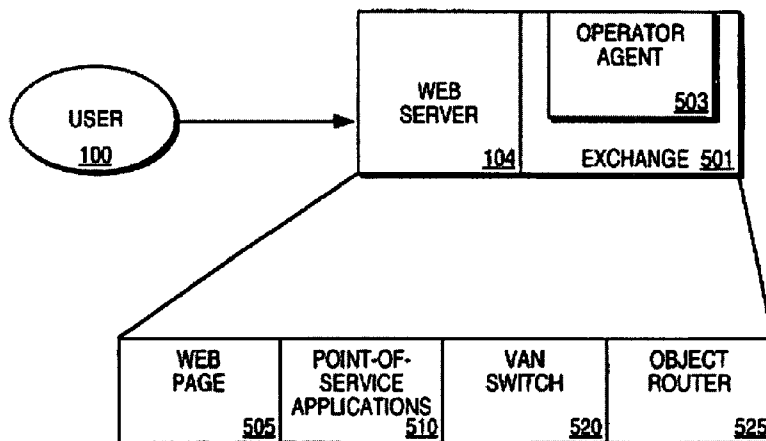
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*Primary Examiner* — Viet Vu(57) **ABSTRACT**

The present invention provides a method and apparatus for providing real-time, two-way transactional capabilities on the Web. Specifically, one embodiment of the present invention discloses a method for enabling object routing, the method comprising the steps of creating a virtual information store containing information entries and attributes associating each of the information entries and the attributes with an object identity, and assigning a unique network address to each of the object identities. A method is also disclosed for enabling service management of the value-added network service, to perform OAM&P functions on the services network

**19 Claims, 13 Drawing Sheets**

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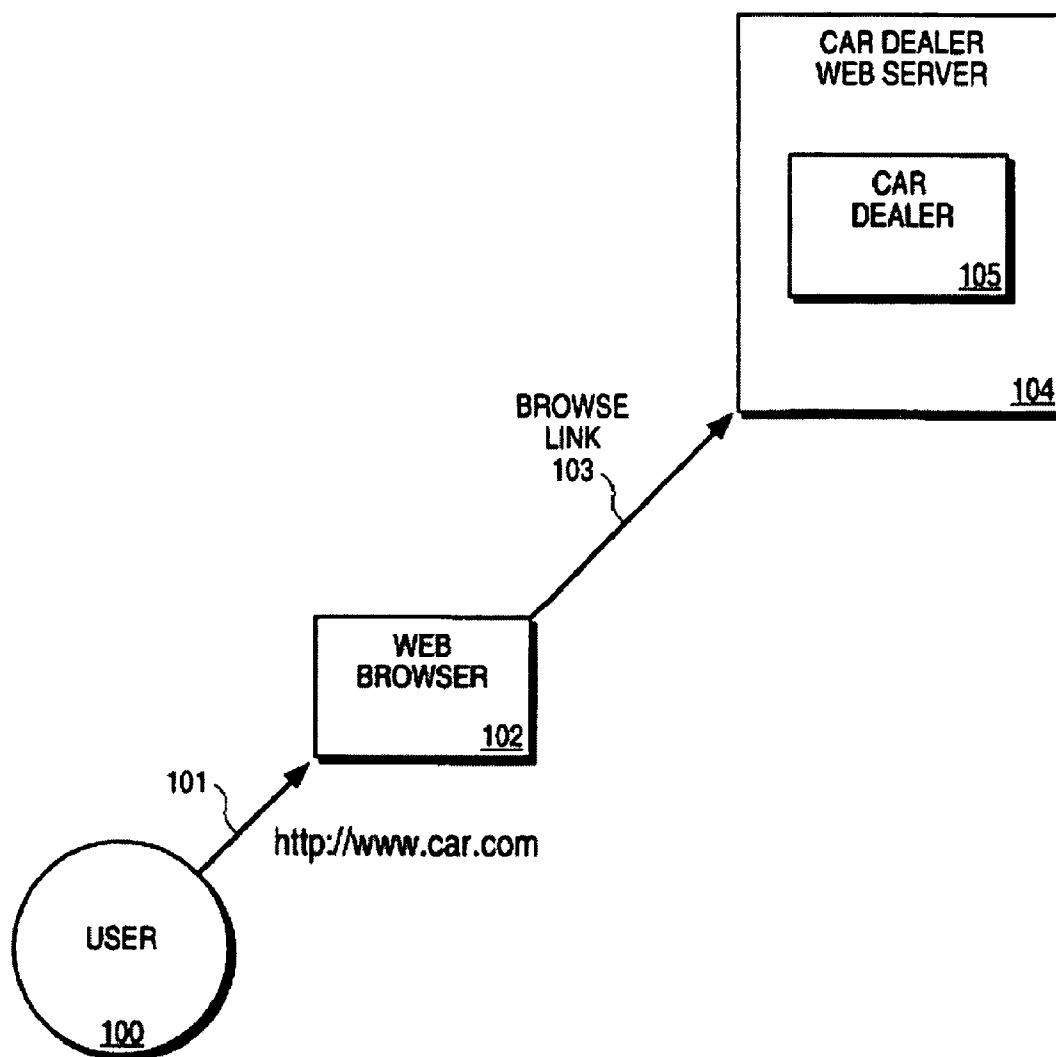


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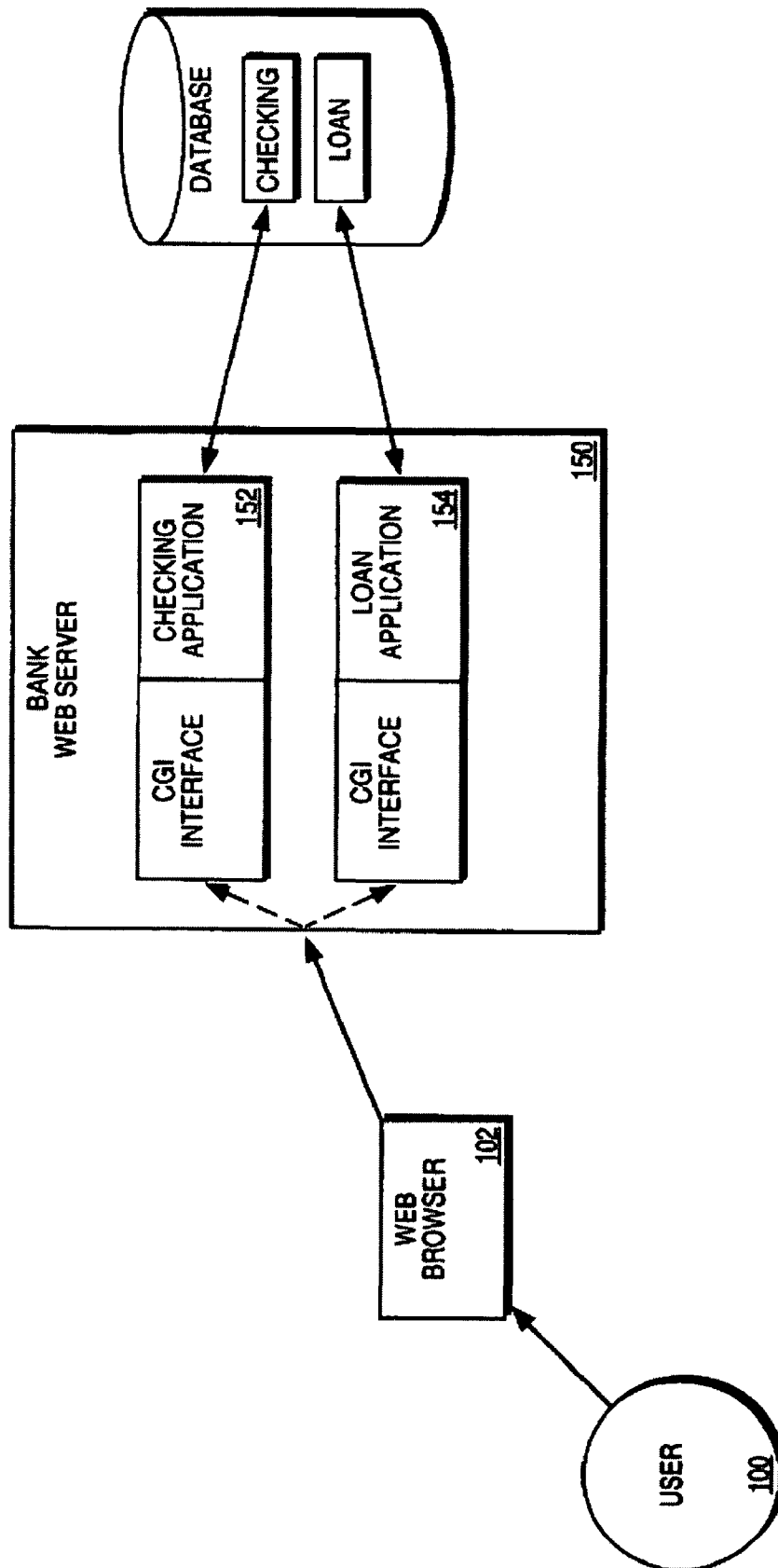
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**FIG. 1A** (PRIOR ART)



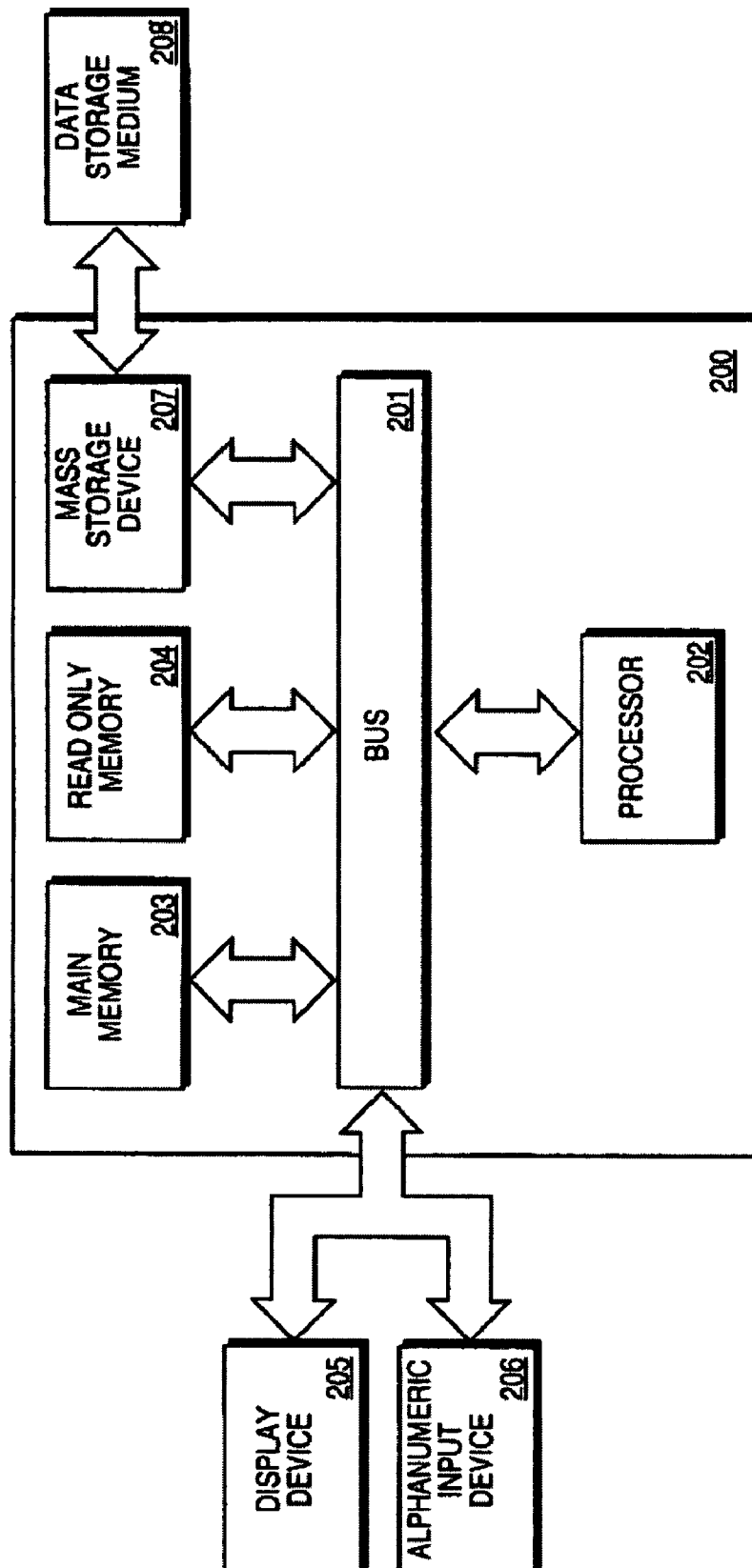
**FIG. 1B** (PRIOR ART)

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**FIG. 2**

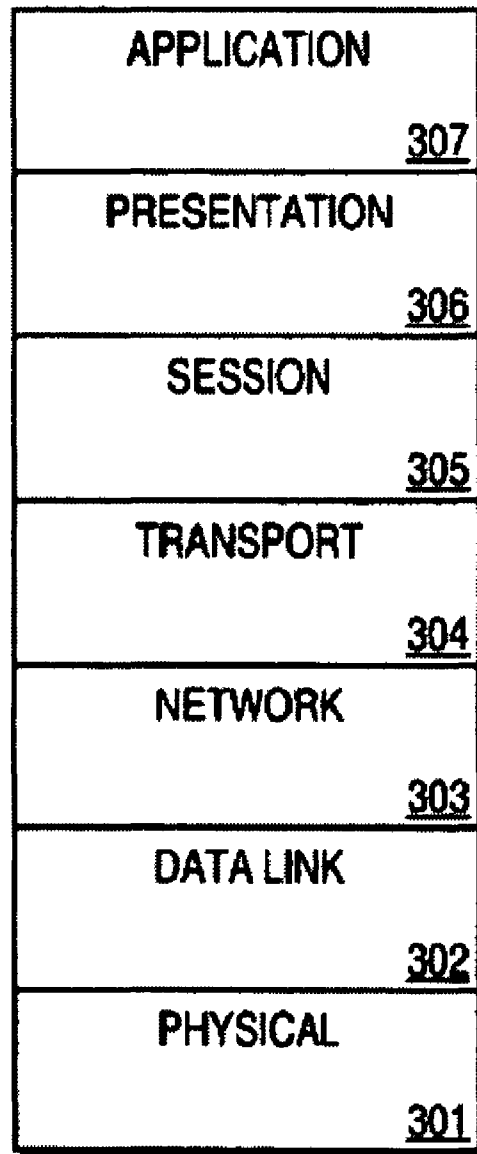
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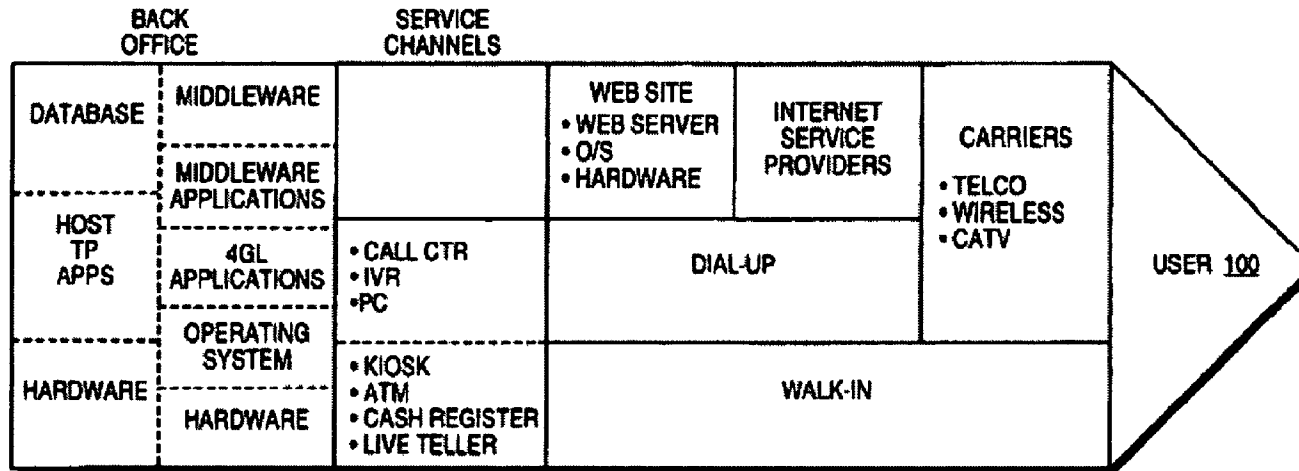
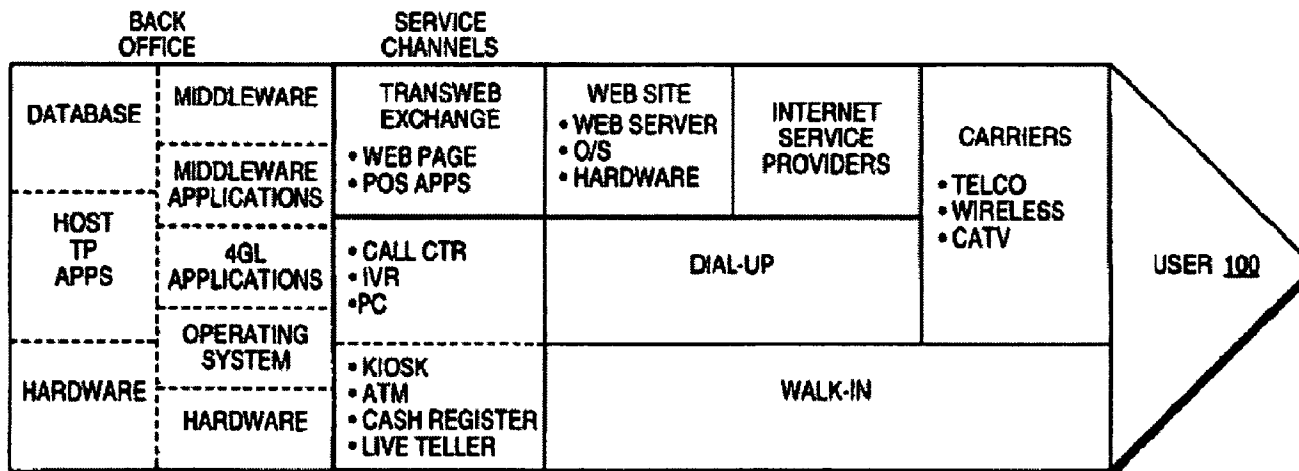
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OSI MODEL  
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**FIG. 3**

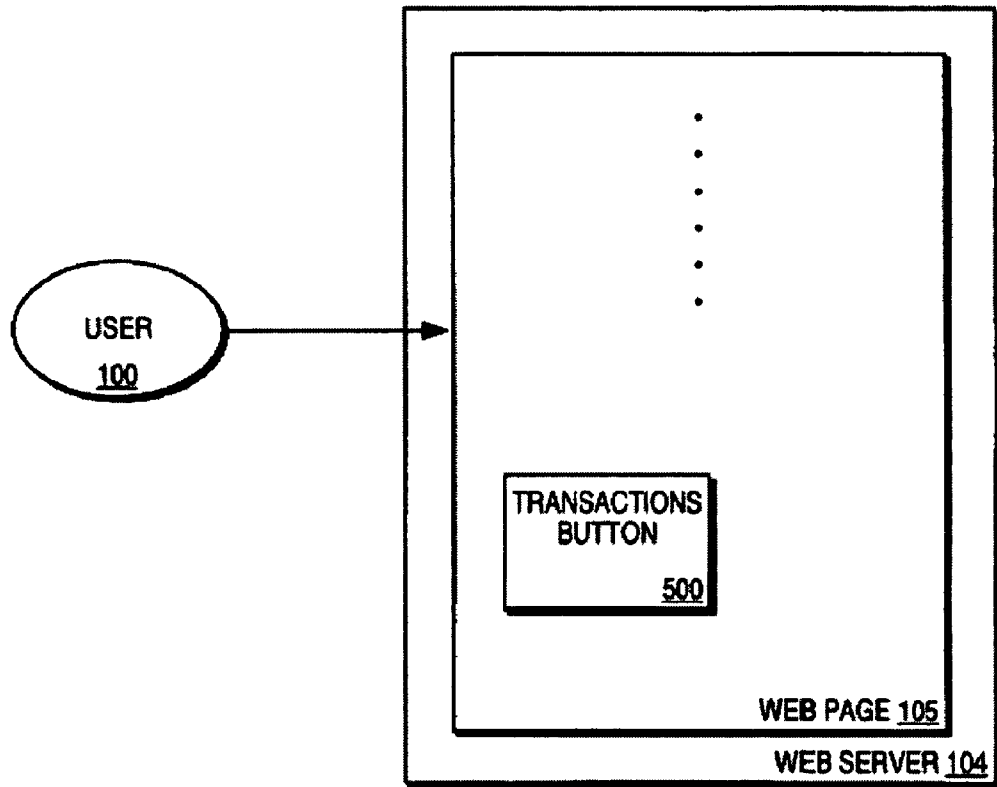
**FIG. 4A****FIG. 4B**

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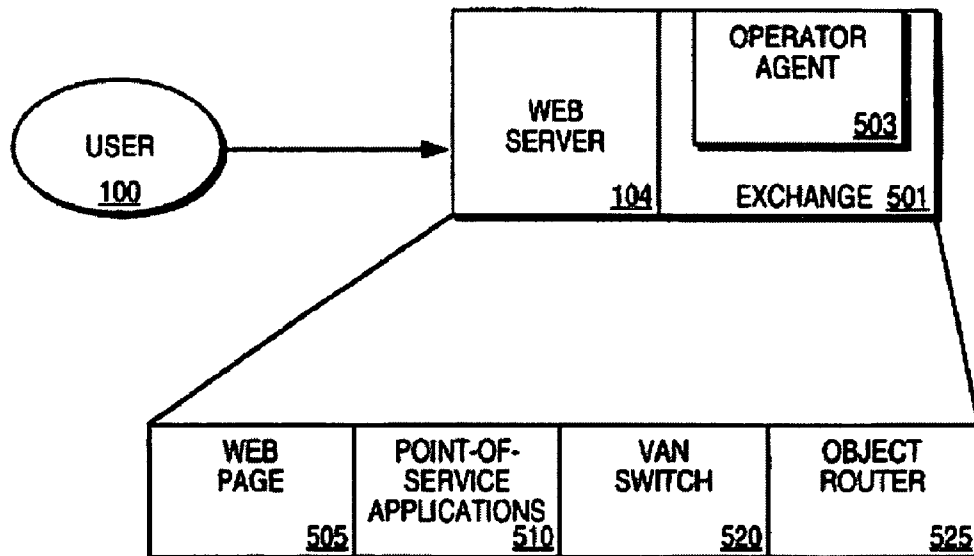
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**FIG. 5A**



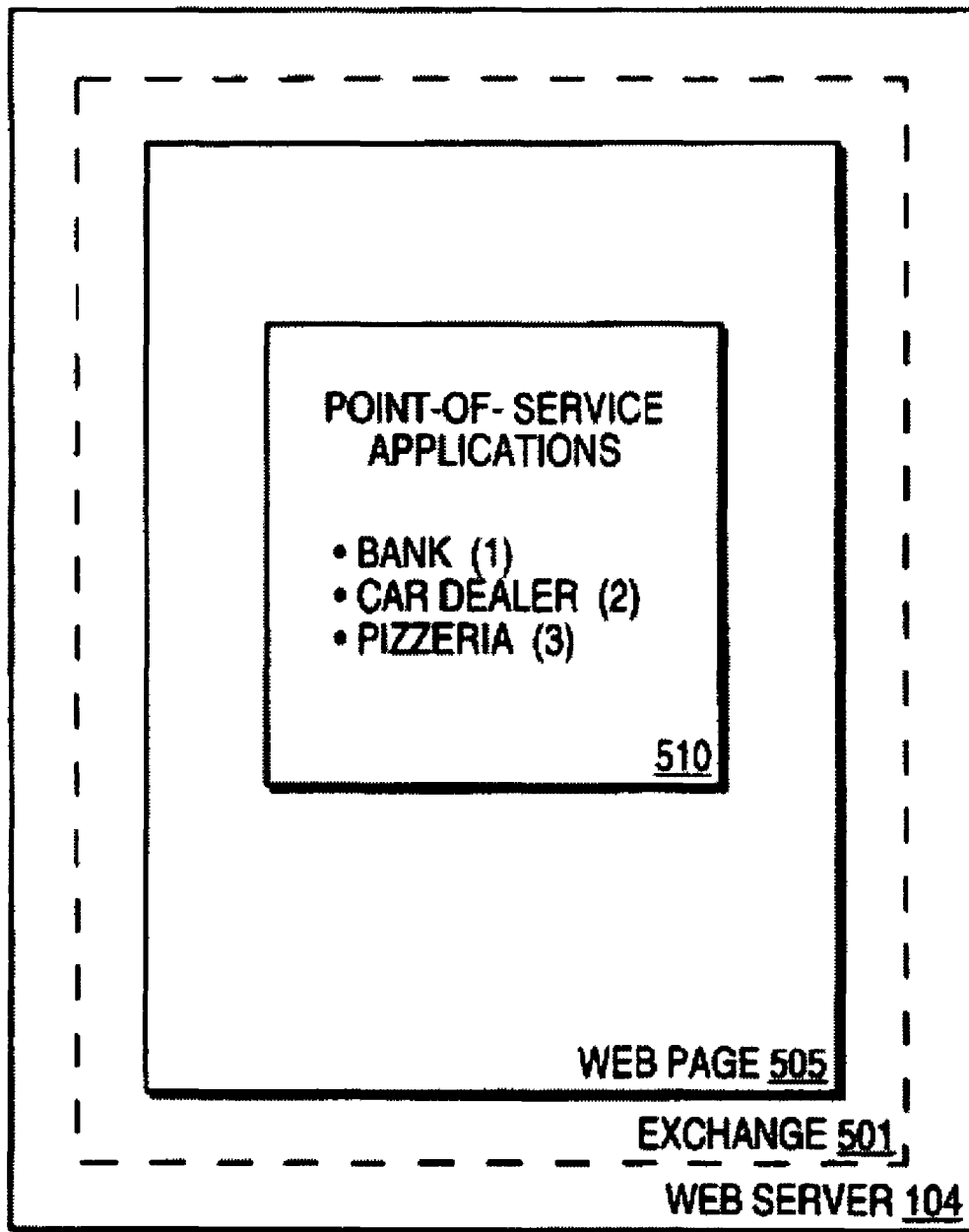
**FIG. 5B**

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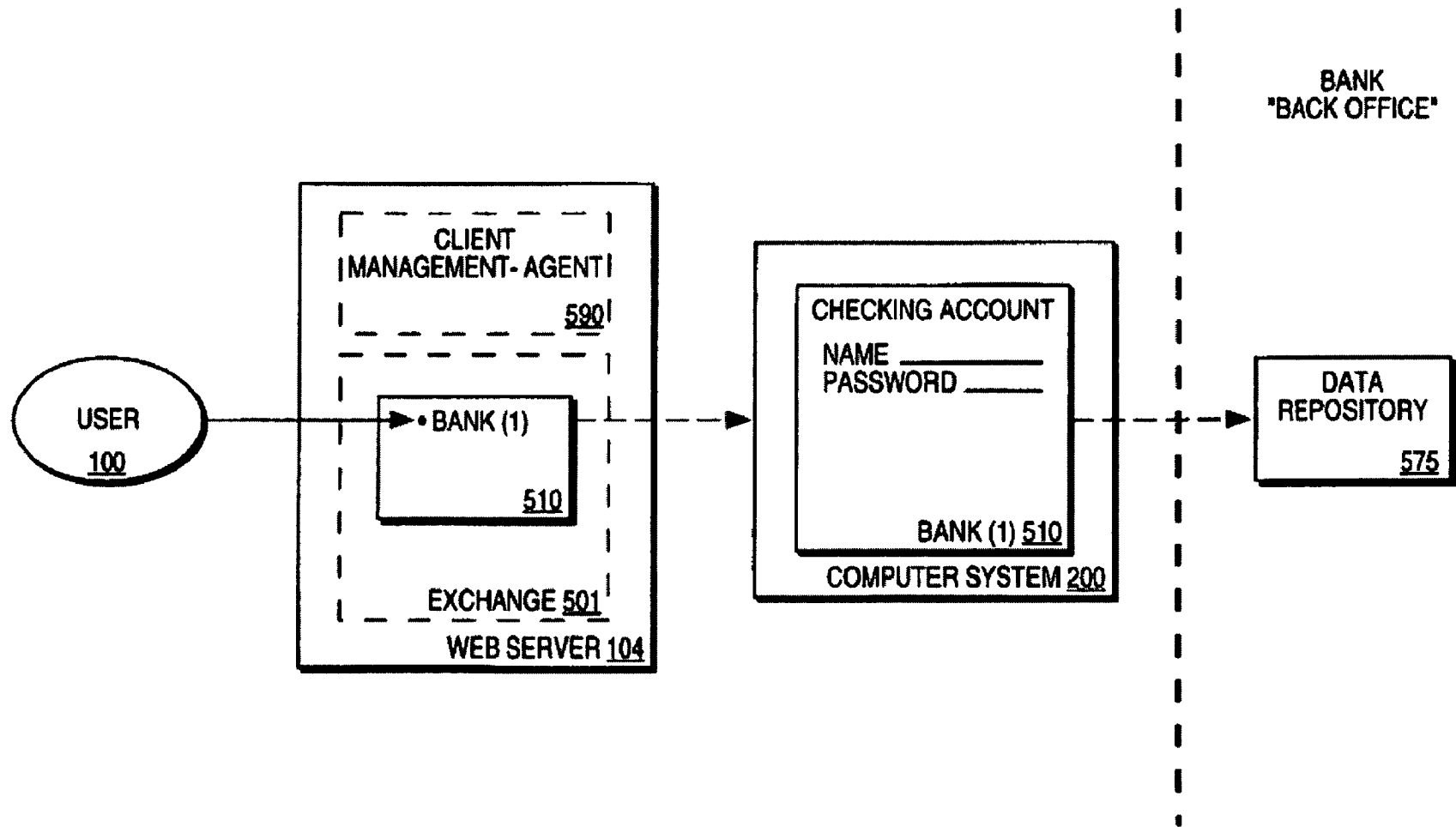
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**FIG. 5C**



**FIG. 5D**

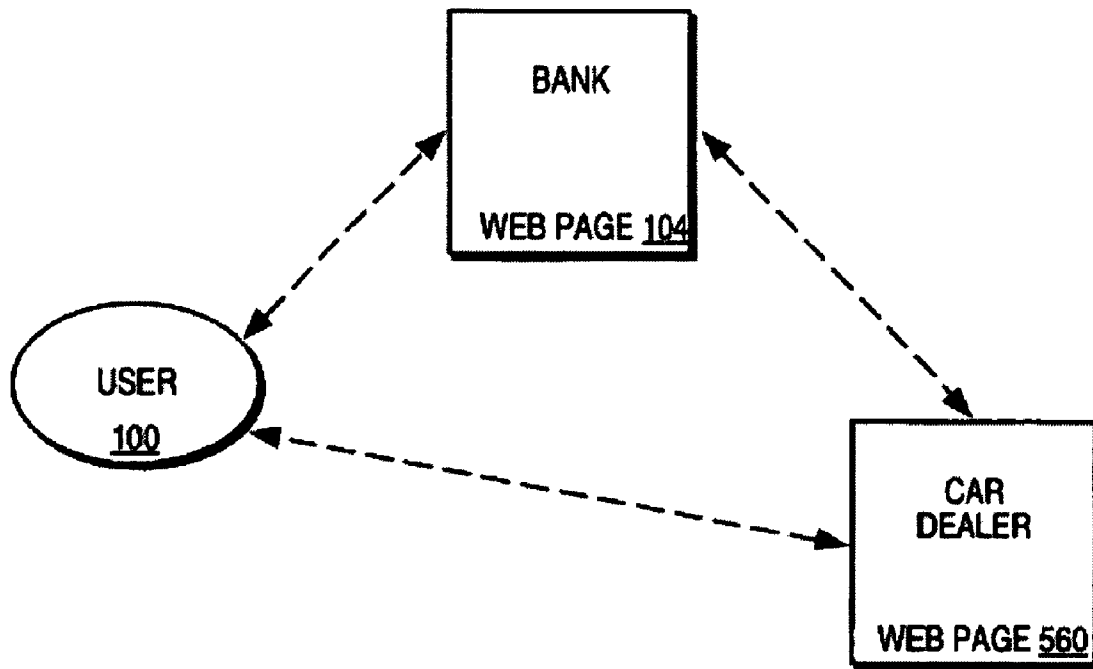


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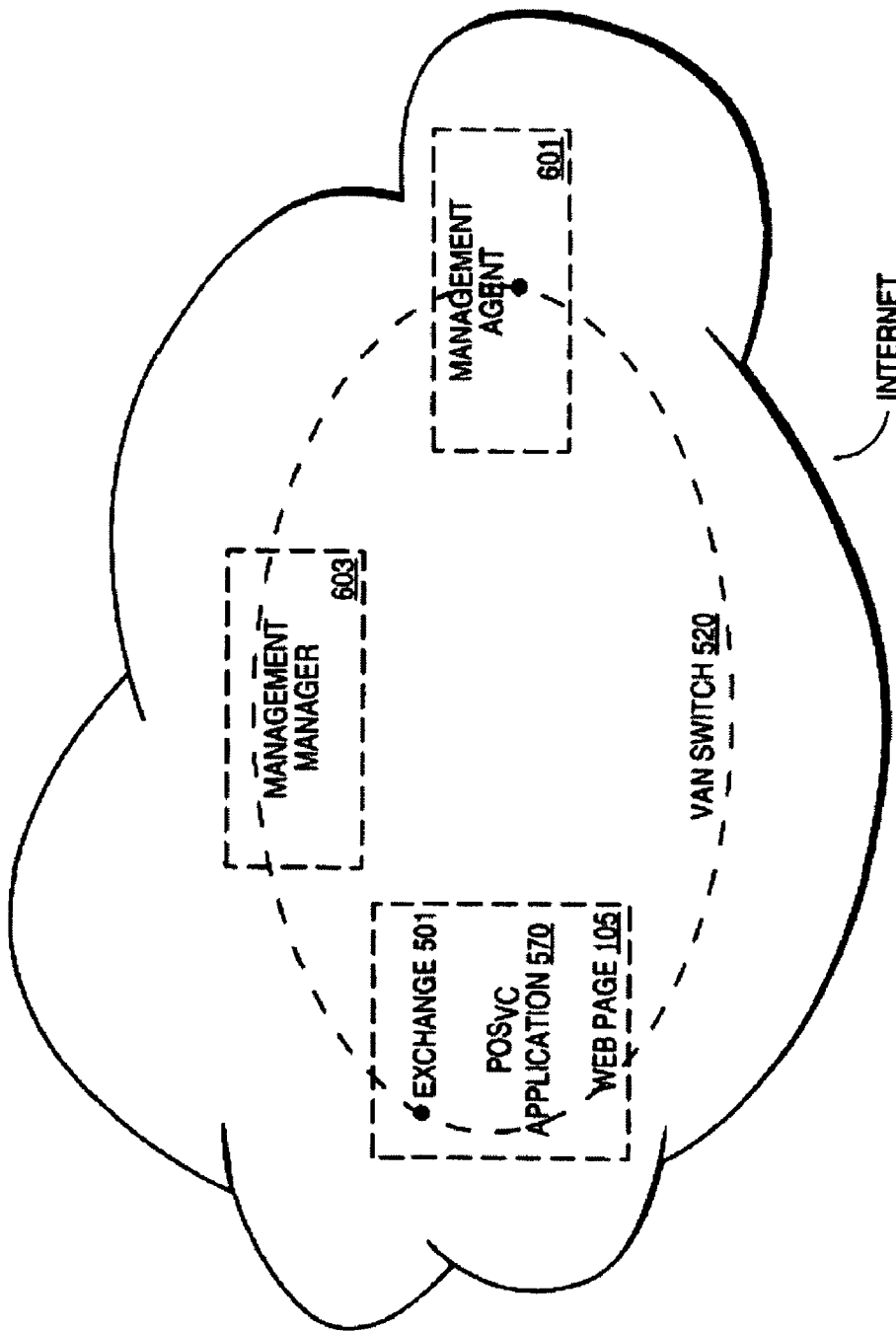
**FIG. 5E**

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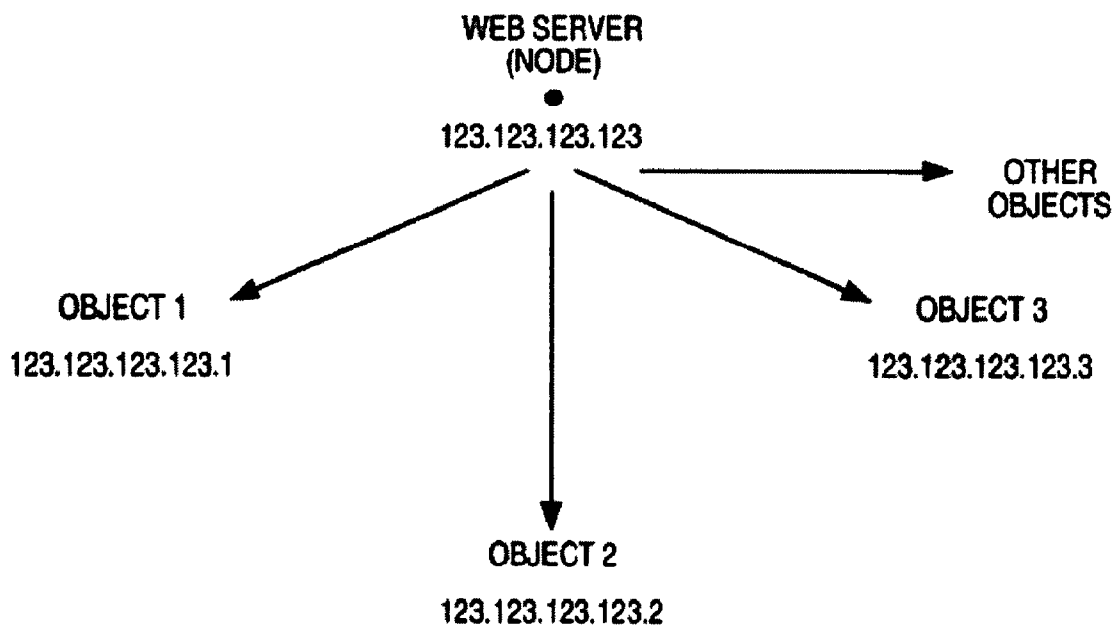
**FIG. 6A**

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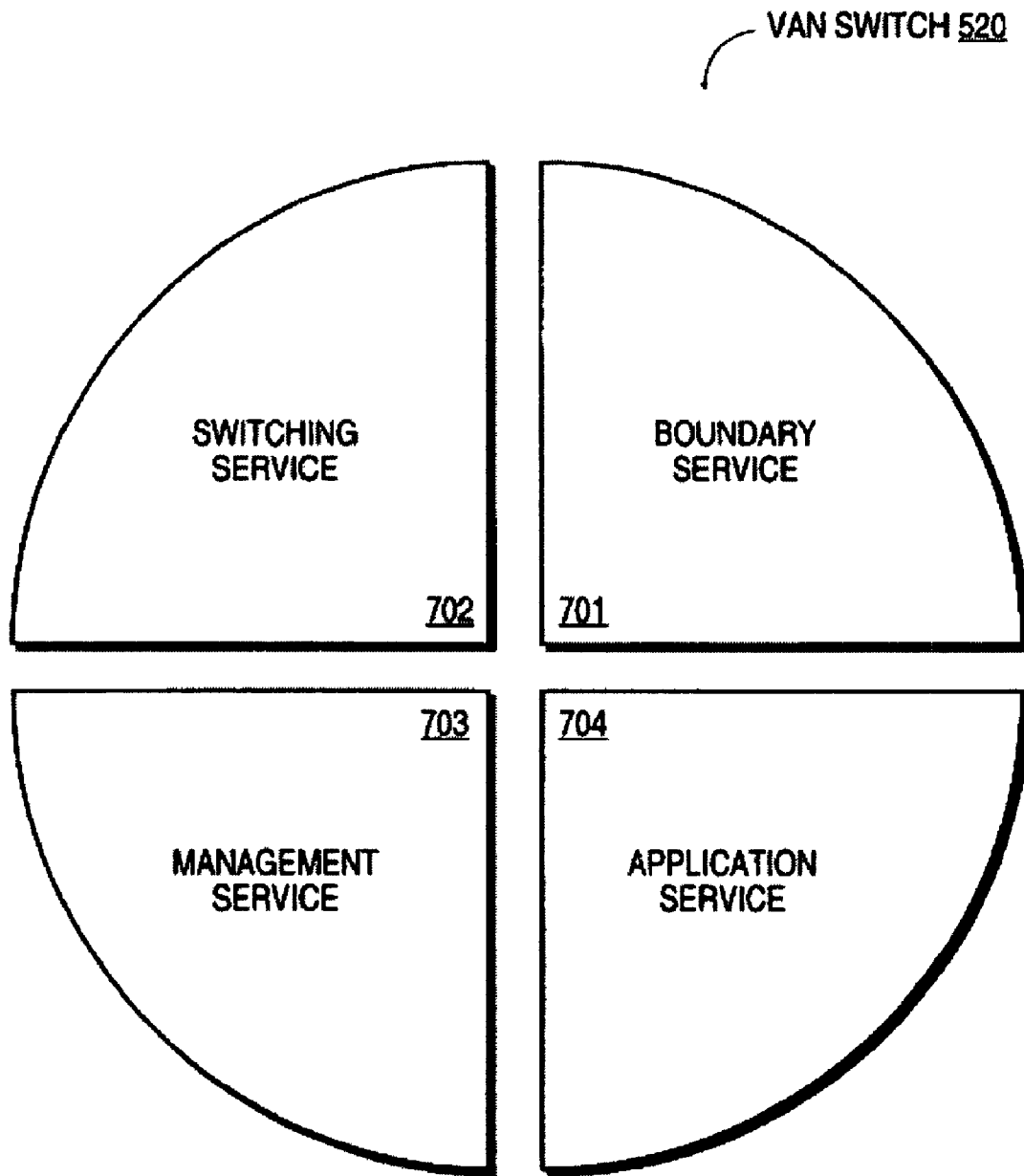
**FIG. 6B**

**U.S. Patent**

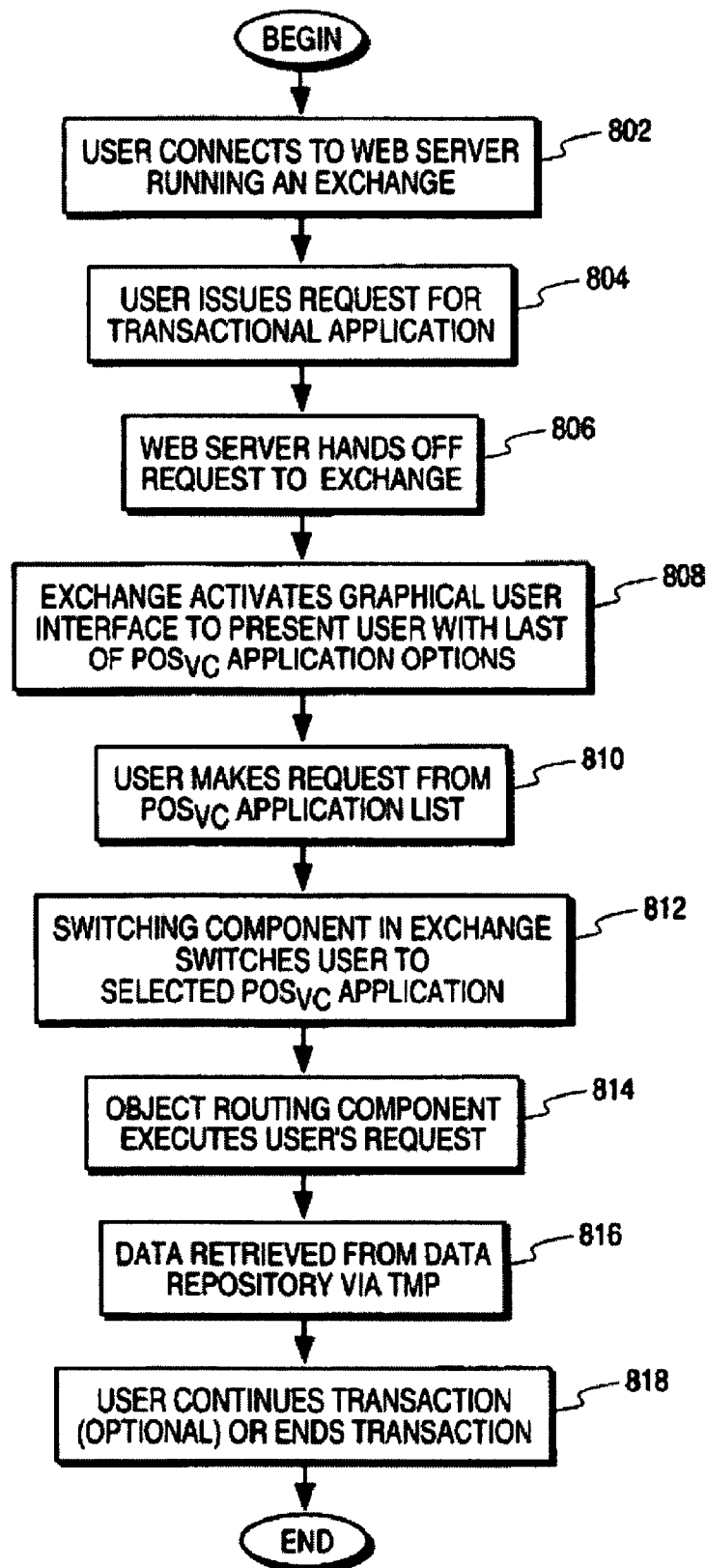
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**FIG. 7**

**FIG. 8**

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## REAL-TIME WEB TRANSACTIONS FROM WEB APPLICATIONS

### CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a divisional and claims the priority benefit of U.S. patent application Ser. No. 11/980,185 filed Oct. 30, 2007 now U.S. Pat. No. 8,037,158, which is a continuation-in-part of Ser. No. 09/792,323, now U.S. Pat. No. 7,340,506, filed Feb. 23, 2001, which is a divisional of U.S. patent application Ser. No. 09/296,207, filed Apr. 21, 1999 now U.S. Patent No. 6,212,556, which is a continuation-in-part of U.S. patent application Ser. No. 08/879,958, now U.S. Pat. No. 5,987,500, filed Jun. 20, 1997, which is a divisional and claims the priority benefit of U.S. patent application Ser. No. 08/700,726, now U.S. Pat. No. 5,778,178, filed Aug. 5, 1996, which claims the priority benefit of U.S. provisional application 60/006,634 filed Nov. 13, 1995, as does the subject application. This application also claims the benefit under 35 U.S.C. 119(e) to U.S. Provisional application Ser. No. 60/006,634 filed on Nov. 13, 1995. Related are also application Ser. Nos. 09/863,704, now U.S. Pat. No. 7,930,340; 12/628,060; 12/628,068; 12/628,069, 12/932,758 and 60/206,422.

### BACKGROUND

#### 1. Field of the Invention

The present invention relates to the area of Internet communications. Specifically, the present invention relates to a method and apparatus for configurable value-added network switching and object routing.

#### 2. Background of the Invention

With the Internet and the World Wide Web ("the Web") evolving rapidly as a viable consumer medium for electronic commerce, new on-line services are emerging to fill the needs of on-line users. An Internet user today can browse on the Web via the use of a Web browser. Web browsers are software interfaces that run on Web clients to allow access to Web servers via a simple user interface. A Web user's capabilities today from a Web browser are, however, extremely limited. The user can perform one-way, browse-only interactions. Additionally, the user has limited "deferred" transactional capabilities, namely electronic mail (e-mail) capabilities. E-mail capabilities are referred to as "deferred transactions" because the consumer's request is not processed until the e-mail is received, read, and the person or system reading the e-mail executes the transaction. This transaction is thus not performed in real-time.

FIG. 1A illustrates typical user interactions on the Web today. User **100** sends out a request from Web browser **102** in the form of a universal resource locator (URL) **101** in the following manner: <http://www.car.com>. URL **101** is processed by Web browser **102** that determines the URL corresponds to car dealer Web page **105**, on car dealer Web server **104**. Web browser **102** then establishes browse link **103** to car dealer Web page **105**. User **100** can browse Web page **105** and select "hot links" to jump to other locations in Web page **105**, or to move to other Web pages on the Web. This interaction is typically a browse-only interaction. Under limited circumstances, the user may be able to fill out a form on car dealer Web page **105**, and e-mail the form to car dealer Web server **104**. This interaction is still strictly a one-way browse mode communications link, with the e-mail providing limited, deferred transactional capabilities.

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Under limited circumstances, a user may have access to two-way services on the Web via Common Gateway Interface (CGI) applications. CGI is a standard interface for running external programs on a Web server. It allows Web servers to create documents dynamically when the server receives a request from the Web browser. When the Web server receives a request for a document, the Web server dynamically executes the appropriate CGI script and transmits the output of the execution back to the requesting Web browser. This interaction can thus be termed a "two-way" transaction. It is a severely limited transaction, however, because each CGI application is customized for a particular type of application or service.

For example, as illustrated in FIG. 1B, user **100** may access bank **150**'s Web server and attempt to perform transactions on checking account **152** and to make a payment on loan account **154**. In order for user **100** to access checking account **152** and loan account **154** on the Web, CGI application scripts must be created for each account, as illustrated in FIG. 1B. The bank thus has to create individual scripts for each of its services to offer users access to these services. User **100** can then interact in a limited fashion with these individual applications. Creating and managing individual CGI scripts for each service is not a viable solution for merchants with a large number of services.

As the Web expands and electronic commerce becomes more desirable, the need increases for robust, real-time, bi-directional transactional capabilities on the Web. A true real-time, bi-directional transaction would allow a user to connect to a variety of services on the Web, and perform real-time transactions on those services. For example, although user **100** can browse car dealer Web page **105** today, the user cannot purchase the car, negotiate a car loan or perform other types of real-time, two-way transactions that he can perform with a live salesperson at the car dealership. Ideally, user **100** in FIG. 1A would be able to access car dealer Web page **105**, select specific transactions that he desires to perform, such as purchase a car, and perform the purchase in real-time, with two-way interaction capabilities. CGI applications provide user **100** with a limited ability for two-way interaction with car dealer Web page **105**, but due to the lack of interaction and management between the car dealer and the bank, he will not be able to obtain a loan and complete the purchase of the car via a CGI application. The ability to complete robust real-time, two-way transactions is thus not truly available on the Web today.

### SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a method and apparatus for providing real-time, two-way transactional capabilities on the Web. Specifically, one embodiment of the present invention discloses a configurable value-added network switch for enabling real-time transactions on the World Wide Web. The configurable value added network switch comprises means for switching to a transactional application in response to a user specification from a World Wide Web application, means for transmitting a transaction request from the transactional application, and means for processing the transaction request.

According to another aspect of the present invention, a method and apparatus for enabling object routing on the World Wide Web is disclosed. The method for enabling object routing comprises the steps of creating a virtual information store containing information entries and attributes, associat-

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ing each of the information entries and the attributes with an object identity, and assigning a unique network address to each of the object identities.

Other objects, features and advantages of the present invention will be apparent from the accompanying drawings and from the detailed description.

## BRIEF DESCRIPTION OF THE DRAWINGS

The features and advantages of the present invention will be apparent from the accompanying drawings and from the detailed description of the present invention as set forth below.

FIG. 1A is an illustration of a current user's browse capabilities on the Web via a Web browser.

FIG. 1B is an illustration of a current user's capabilities to perform limited transactions on the Web via CGI applications.

FIG. 2 illustrates a typical computer system on which the present invention may be utilized.

FIG. 3 illustrates the Open Systems Interconnection (OSI) Model.

FIG. 4A illustrates conceptually the user value chain as it exists today.

FIG. 4B illustrates one embodiment of the present invention.

FIG. 5A illustrates a user accessing a Web server including one embodiment of the present invention.

FIG. 5B illustrates the exchange component according to one embodiment of the present invention.

FIG. 5C illustrates an example of a point-of-service (POSvc) application list.

FIG. 5D illustrates a user selecting a bank POSvc application from the POSvc application list.

FIG. 5E illustrates a three-way transaction according to one embodiment of the present invention.

FIG. 6A illustrates a value-added network (VAN) switch.

FIG. 6B illustrates the hierarchical addressing tree structure of the networked objects in DOLSIBs.

FIG. 7 illustrates conceptually the layered architecture of a VAN switch.

FIG. 8 is a flow diagram illustrating one embodiment of the present invention.

## DETAILED DESCRIPTION

The present invention relates to a method and apparatus for configurable value-added network switching and object routing and management. "Web browser" as used in the context of the present specification includes conventional Web browsers such as NCSA Mosaic™ from NCSA and Netscape Mosaic™ from Netscape™. The present invention is independent of the Web browser being utilized and the user can use any Web browser, without modifications to the Web browser. In the following detailed description, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be apparent to one of ordinary skill in the art, however, that these specific details need not be used to practice the present invention. In other instances, well-known structures, interfaces and processes have not been shown in detail in order not to unnecessarily obscure the present invention.

FIG. 2 illustrates a typical computer system 200 in which the present invention operates. The preferred embodiment of the present invention is implemented on an IBM™ Personal Computer manufactured by IBM Corporation of Armonk, N.Y. Alternate embodiments may be implemented on a

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Macintosh™ computer manufactured by Apple™ Computer, Incorporated of Cupertino, Calif. It will be apparent to those of ordinary skill in the art that other alternative computer system architectures may also be employed.

In general, such computer systems as illustrated by FIG. 2 comprise a bus 201 for communicating information, a processor 202 coupled with the bus 201 for processing information, main memory 203 coupled with the bus 201 for storing information and instructions for the processor 202, a read-only memory 204 coupled with the bus 201 for storing static information and instructions for the processor 202, a display device 205 coupled with the bus 201 for displaying information for a computer user, an input device 206 coupled with the bus 201 for communicating information and command selections to the processor 202, and a mass storage device 207, such as a magnetic disk and associated disk drive, coupled with the bus 201 for storing information and instructions. A data storage medium 208 containing digital information is configured to operate with mass storage device 207 to allow processor 202 access to the digital information on data storage medium 208 via bus 201.

Processor 202 may be any of a wide variety of general purpose processors or microprocessors such as the Pentium™ microprocessor manufactured by Intel™ Corporation or the Motorola™ 68040 or Power PC™ brand microprocessor manufactured by Motorola™ Corporation. It will be apparent to those of ordinary skill in the art, however, that other varieties of processors may also be used in a particular computer system. Display device 205 may be a liquid crystal device, cathode ray tube (CRT), or other suitable display device. Mass storage device 207 may be a conventional hard disk drive, floppy disk drive, CD-ROM drive, or other magnetic or optical data storage device for reading and writing information stored on a hard disk, a floppy disk, a CD-ROM, a magnetic tape, or other magnetic or optical data storage medium. Data storage medium 208 may be a hard disk, a floppy disk, a CD-ROM, a magnetic tape, or other magnetic or optical data storage medium.

In general, processor 202 retrieves processing instructions and data from a data storage medium 208 using mass storage device 207 and downloads this information into random access memory 203 for execution. Processor 202, then executes an instruction stream from random access memory 203 or read-only memory 204. Command selections and information input at input device 206 are used to direct the flow of instructions executed by processor 202. Equivalent input device 206 may also be a pointing device such as a conventional mouse or trackball device. The results of this processing execution are then displayed on display device 205.

The preferred embodiment of the present invention is implemented as a software module, which may be executed on a computer system such as computer system 200 in a conventional manner. Using well known techniques, the application software of the preferred embodiment is stored on data storage medium 208 and subsequently loaded into and executed within computer system 200. Once initiated, the software of the preferred embodiment operates in the manner described below.

FIG. 3 illustrates the Open Systems Interconnection (OSI) reference model. OSI Model 300 is an international standard that provides a common basis for the coordination of standards development, for the purpose of systems interconnection. The present invention is implemented to function as a routing switch within the "application layer" of the OSI model. The model defines seven layers, with each layer communicating with its peer layer in another node through the use

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of a protocol. Physical layer **301** is the lowest layer, with responsibility to transmit unstructured bits across a link. Data link layer **302** is the next layer above physical layer **301**. Data link layer **302** transmits chunks across the link and deals with problems like checksumming to detect data corruption, orderly coordination of the use of shared media and addressing when multiple systems are reachable. Network bridges operate within data link layer **302**.

Network layer **303** enables any pair of systems in the network to communicate with each other. Network layer **303** contains hardware units such as routers that handle routing, packet fragmentation and reassembly of packets. Transport layer **304** establishes a reliable communication stream between a pair of systems, dealing with errors such as lost packets, duplicate packets, packet reordering and fragmentation. Session layer **305** offers services above the simple communication stream provided by transport layer **304**. These services include dialog control and chaining. Presentation layer **306** provides a means by which OSI compliant applications can agree on representations for data. Finally, application layer **307** includes services such as file transfer, access and management services (FTAM), electronic mail and virtual terminal (VT) services. Application layer **307** provides a means for application programs to access the OSI environment. As described above, the present invention is implemented to function as a routing switch in application layer **307**. Application layer routing creates an open channel for the management, and the selective flow of data from remote databases on a network.

#### A. Overview

FIG. 4A illustrates conceptually the user value chain as it exists today. The user value chain in FIG. 4A depicts the types of transactions that are performed today, and the channels through which the transactions are performed. A “transaction” for the purposes of the present invention includes any type of commercial or other type of interaction that a user may want to perform. Examples of transactions include a deposit into a bank account, a request for a loan from a bank, a purchase of a car from a car dealership or a purchase of a car with financing from a bank. A large variety of other transactions are also possible.

A typical user transaction today may involve user **100** walking into a bank or driving up to a teller machine, and interacting with a live bank teller, or automated teller machine (ATM) software applications. Alternatively, user **100** can perform the same transaction by using a personal computer (PC), activating application software on his PC to access his bank account, and dialing into the bank via a modem line. If user **100** is a Web user, however, there is no current mechanism for performing a robust, real-time transaction with the bank, as illustrated in FIG. 4A. CGI scripts provide only limited two-way capabilities, as described above. Thus, due to this lack of a robust mechanism by which real-time Web transactions can be performed, the bank is unable to be a true “Web merchant,” namely a merchant capable of providing complete transactional services on the Web.

According to one embodiment of the present invention, as illustrated in FIG. 4B, each merchant that desires to be a Web merchant can provide real-time transactional capabilities to users who desire to access the merchants’ services via the Web. This embodiment includes a service network running on top of a facilities network, namely the Internet, the Web or e-mail networks. For the purposes of this application, users are described as utilizing PC’s to access the Web via Web server “switching” sites. (Switching is described in more detail below). Users may also utilize other personal devices such as network computers or cellular devices to access the

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merchants’ services via appropriate switching sites. These switching sites include non-Web network computer sites and cellular provider sites. Five components interact to provide this service network functionality, namely an exchange, an operator agent, a management agent, a management manager and a graphical user interface. All five components are described in more detail below.

As illustrated in FIG. 5A, user **100** accesses Web server **104**. Having accessed Web server **104**, user **100** can decide that he desires to perform real-time transactions. When Web server **104** receives user **100**’s indication that he desires to perform real-time transactions, the request is handed over to an exchange component. Thus, from Web page **105**, for example, user **100** can select button **500**, entitled “Transactions” and Web server **104** hands user **100**’s request over to the exchange component. The button and the title can be replaced by any mechanism that can instruct a Web server to hand over the consumer’s request to the exchange component.

FIG. 5B illustrates exchange **501**. Exchange **501** comprises Web page **505** and point-of-service (POSvc) applications **510**. Exchange **501** also conceptually includes a switching component and an object routing component (described in more detail below). POSvc applications **510** are transactional applications, namely applications that are designed to incorporate and take advantage of the capabilities provided by the present invention. Although exchange **501** is depicted as residing on Web server **104**, the exchange can also reside on a separate computer system that resides on the Internet and has an Internet address. Exchange **501** may also include operator agent **503** that interacts with a management manager (described in more detail below). Exchange **501** creates and allows for the management (or distributed control) of a service network, operating within the boundaries of an IP-based facilities network. Thus, exchange **501** and a management agent component, described in more detail below, under the headings “VAN Switch and Object Routing,” together perform the switching, object routing, application and service management functions according to one embodiment of the present invention.

Exchange **501** processes the consumer’s request and displays an exchange Web page **505** that includes a list of POSvc applications **510** accessible by exchange **501**. A POSvc application is an application that can execute the type of transaction that the user may be interested in performing. The POSvc list is displayed via the graphical user interface component. One embodiment of the present invention supports HyperText Markup Language as the graphical user interface component. Virtual Reality Markup Language and Java™ are also supported by this embodiment. A variety of other graphical user interface standards can also be utilized to implement the graphical user interface.

An example of a POSvc application list is illustrated in FIG. 5C. User **100** can thus select from POSvc applications Bank **510(1)**, Car Dealer **510(2)** or Pizzeria **510(3)**. Numerous other POSvc applications can also be included in this selection. If user **100** desires to perform a number of banking transactions, and selects the Bank application, a Bank POSvc application will be activated and presented to user **100**, as illustrated in FIG. 5D. For the purposes of illustration, exchange **501** in FIG. 5D is shown as running on a different computer system (Web server **104**) from the computer systems of the Web merchants running POSvc applications (computer system **200**). Exchange **501** may, however, also be on the same computer system as one or more of the computer systems of the Web merchants.



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Once Bank POSvc application **510** has been activated, user **100** will be able to connect to Bank services and utilize the application to perform banking transactions, thus accessing data from a host or data repository **575** in the Bank "Back Office." The Bank Back Office comprises legacy databases and other data repositories that are utilized by the Bank to store its data. This connection between user **100** and Bank services is managed by exchange **501**. As illustrated in FIG. **5D**, once the connection is made between Bank POSvc application **510(1)**, for example, and Bank services, an operator agent on Web server **104** may be activated to ensure the availability of distributed functions and capabilities.

Each Web merchant may choose the types of services that it would like to offer its clients. In this example, if Bank decided to include in their POSvc application access to checking and savings accounts, user **100** will be able to perform real-time transactions against his checking and savings accounts. Thus, if user **100** moves \$500 from his checking account into his savings account, the transaction will be performed in real-time, in the same manner the transaction would have been performed by a live teller at the bank or an ATM machine. Therefore, unlike his prior access to his account, user **100** now has the capability to do more than browse his bank account. The ability to perform these types of robust, real-time transactions from a Web client is a significant aspect of the present invention.

Bank can also decide to provide other types of services in POSvc application **510(1)**. For example, Bank may agree with Car dealership to allow Bank customers to purchase a car from that dealer, request a car loan from Bank, and have the entire transaction performed on the Web, as illustrated in FIG. **5E**. In this instance, the transactions are not merely two-way, between the user and Bank, but three-way, amongst the consumer, Bank and Car dealership. According to one aspect of the present invention, this three-way transaction can be expanded to n-way transactions, where n represents a predetermined number of merchants or other service providers who have agreed to cooperate to provide services to users. The present invention therefore allows for "any-to-any" communication and transactions on the Web, thus facilitating a large, flexible variety of robust, real-time transactions on the Web.

Finally, Bank may also decide to provide intra-merchant or intra-bank services, together with the inter-merchant services described above. For example, if Bank creates a POSvc application for use by the Bank Payroll department, Bank may provide its own employees with a means for submitting timecards for payroll processing by the Bank's Human Resources (HR) Department. An employee selects the Bank HR POSvc application, and submits his timecard. The employee's timecard is processed by accessing the employee's payroll information, stored in the Bank's Back Office. The transaction is thus processed in real-time, and the employee receives his paycheck immediately.

#### B. Van Switching and Object Routing

As described above, exchange **501** and management agent **601**, illustrated in FIG. **6A**, together constitute a value-added network (VAN) switch. These two elements may take on different roles as necessary, including peer-to-peer, client-server or master-slave roles. Management manager **603** is illustrated as residing on a separate computer system on the Internet. Management manager **603** can, however, also reside on the same machine as exchange **501**. Management manager **603** interacts with the operator agent **503** residing on exchange **501**.

VAN switch **520** provides multi-protocol object routing, depending upon the specific VAN services chosen. This multi-protocol object routing is provided via a proprietary

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protocol, TransWeb™ Management Protocol (TMP). TMP incorporates the same security features as the traditional Simple Network Management Protocol, SNMP. It also allows for the integration of other traditional security mechanisms, including RSA security mechanisms.

One embodiment of the present invention utilizes TMP and distributed on-line service information bases (DOLSIBs) to perform object routing. Alternatively, TMP can incorporate s-HTTP, Java™, the WinSock API or ORB with DOLSIBs to perform object routing. DOLSIBs are virtual information stores optimized for networking. All information entries and attributes in a DOLSIB virtual information store are associated with a networked object identity. The networked object identity identifies the information entries and attributes in the DOLSIB as individual networked objects, and each networked object is assigned an Internet address. The Internet address is assigned based on the IP address of the node at which the networked object resides.

For example, in FIG. **5A**, Web server **104** is a node on the Internet, with an IP address. All networked object associated with Web server **104** will therefore be assigned an Internet address based on the Web server **104**'s IP address. These networked objects thus "branch" from the node, creating a hierarchical tree structure. The Internet address for each networked object in the tree essentially establishes the individual object as an "IP-reachable" or accessible node on the Internet. TMP utilizes this Internet address to uniquely identify and access the object from the DOLSIB. FIG. **6B** illustrates an example of this hierarchical addressing tree structure.

Each object in the DOLSIB has a name, a syntax and an encoding. The name is an administratively assigned object ID specifying an object type. The object type together with the object instance serves to uniquely identify a specific instantiation of the object. For example, if object **610** is information about models of cars, then one instance of that object would provide user **100** with information about a specific model of the car while another instance would provide information about a different model of the car. The syntax of an object type defines the abstract data structure corresponding to that object type. Encoding of objects defines how the object is represented by the object type syntax while being transmitted over the network.

#### C. Management and Administration

As described above, exchange **501** and management agent **601** together constitute a VAN switch. FIG. **7** illustrates conceptually the layered architecture of VAN switch **520**. Specifically, boundary service **701** provides the interfaces between VAN switch **520**, the Internet and the Web, and multi-media end user devices such as PCs, televisions or telephones. Boundary service **701** also provides the interface to the on-line service provider. A user can connect to a local application, namely one accessible via a local VAN switch, or be routed or "switched" to an application accessible via a remote VAN switch.

Switching service **702** is an OSI application layer switch. Switching service **702** thus represents the core of the VAN switch. It performs a number of tasks including the routing of user connections to remote VAN switches, described in the paragraph above, multiplexing and prioritization of requests, and flow control. Switching service **702** also facilitates open systems' connectivity with both the Internet (a public switched network) and private networks including back office networks, such as banking networks. Interconnected application layer switches form the application network backbone. These switches are one significant aspect of the present invention.

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Management service **703** contains tools such as Information Management Services (IMS) and application Network Management Services (NMS). These tools are used by the end users to manage network resources, including VAN switches. Management service **703** also provides applications that perform Operations, Administration, Maintenance & Provisioning (OAM&P) functions. These OAM&P functions include security management, fault management, configuration management, performance management and billing management. Providing OAM&P functions for applications in this manner is another significant aspect of the present invention.

Finally, application service **704** contains application programs that deliver customer services. Application service **704** includes POSvc applications such as Bank POSvc described above, and illustrated in FIG. 6A. Other examples of VAN services include multi-media messaging, archival/retrieval management, directory services, data staging, conferencing, financial services, home banking, risk management and a variety of other vertical services. Each VAN service is designed to meet a particular set of requirements related to performance, reliability, maintenance and ability to handle expected traffic volume. Depending on the type of service, the characteristics of the network elements will differ. VAN service **704** provides a number of functions including communications services for both management and end users of the network and control for the user over the user's environment.

FIG. 8 is a flow diagram illustrating one embodiment of the present invention. A user connects to a Web server running an exchange component in step **802**. In step **804**, the user issues a request for a transactional application, and the web server hands off the request to an exchange in step **806**. The exchange activates a graphical user interface to present user with a list of POSvc application options in step **808**. In step **810**, the user makes a selection from the POSvc application list. In step **812**, the switching component in the exchange switches the user to the selected POSvc application, and in step **814**, the object routing component executes the user's request. Data is retrieved from the appropriate data repository via TMP in step **816**, and finally, the user may optionally continue the transaction in step **818** or end the transaction.

Thus, a configurable value-added network switching and object routing method and apparatus is disclosed. These specific arrangements and methods described herein are merely illustrative of the principles of the present invention. Numerous modifications in form and detail may be made by those of ordinary skill in the art without departing from the scope of the present invention. Although this invention has been shown in relation to a particular preferred embodiment, it should not be considered so limited. Rather, the present invention is limited only by the scope of the appended claims.

What is claimed is:

1. A computer-implemented method for completing a real-time Web transaction from a Web application in an on-line service over a digital network on the Web, the method comprising:

displaying at least one Web application specific to an on-line service over a digital network on the Web, wherein the Web application is a point-of-service (POSvc) Web application, and further wherein the digital network is an overlay service network running on top of an IP-based facilities network selected from a group consisting of the physical TCP/IP-based Internet, the Web and email networks, wherein the facilities network is a physical network;

accepting a first signal comprising a request from the point-of-service (POSvc) Web application for a real-time Web

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transaction specific to a Web merchant's value-added network service on the Web offered as the online service over the digital network on the Web;

utilizing one or more objects in the Web application and the information entries and the attributes of the one or more objects, wherein the one or more objects are one or more individual data structures in and specific to the POSvc Web application in said request, wherein the individual data structure in the POSvc Web application is an object identity with the information entries and attributes specific to the Web transaction request from the Web application, to connect in real-time to the value-added network service of the Web merchant without executing Common Gateway Interface (CGI) scripts;

executing said connection at the OSI application layer, utilizing application layer routing of the object identity with the information entries and attributes over the service network on the Web, and further wherein the object in the POSvc Web application is not an SNMP object;

routing the one or more individual data structures in the POSvc Web application together with said information entries and attributes from said Web application over the service network on the Web, wherein the routing the one or more individual data structures in the POSvc Web application together with said information entries and attributes from said Web application over the service network on the Web is object routing on the World Wide Web performed as OSI application layer routing, distinct from routing at the transport layer of the OSI model or network layer of the OSI model or lower layers of the OSI model;

managing the connection between said Web transaction request from the POSvc Web application and the Web merchant's services from end-to-end in real-time; and completing a real-time Web transaction from said Web application, wherein the online service is a loan Web application.

2. An apparatus for completing a real-time Web transaction from a Web application in an on-line service over a digital network on the Web, the apparatus comprising:

a processor;

a machine-readable storage device including one or more instructions executable by the processor for accepting a first signal comprising a request from a point-of-service (POSvc) Web application for a real-time Web transaction specific to a Web merchant's value-added network service on the Web;

utilizing an object in the Web application and the information entries and the attributes of an individual data structure in the POSvc Web application in said request to connect in real-time to the value-added network service of the Web merchant without executing Common Gateway Interface (CGI) scripts, and further wherein the object in the POSvc Web application is not an SNMP object;

executing said connection at the OSI application layer, routing said individual data structure with the information entries and attributes together from said Web application over the service network on the Web, wherein said individual data structure in the POSvc Web application in said request is an object identity in the POSvc Web application, and further wherein said routing performed at the OSI application layer is distinct from routing at the transport layer of the OSI model or network layer of the OSI model or lower layers of the OSI model; and completing a real-time Web transaction from said Web application.

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3. A machine-readable storage device including instructions executable by a processor, the machine-readable storage device including one or more instructions for:

accepting a first signal comprising a request from a point-of-service (POSvc) Web application for a real-time Web transaction specific to a Web merchant's value-added network service on the Web; from

utilizing one or more objects in the Web application and the information entries and the attributes of the one or more objects, wherein the one or more objects are one or more individual data structures in and specific to the POSvc Web application in said request, wherein the object identity in the Web application is the individual data structure in the POSvc Web application, to connect in real-time to the value-added network service of the Web merchant without executing Common Gateway Interface (CGI) scripts;

executing said connection at the OSI application layer, utilizing application layer routing on the Web;

routing the one or more individual data structures in the POSvc Web application together with said information entries and attributes from said Web application over a service network on the Web running on top of a facilities network selected from a group consisting of the physical TCP/IP-based Internet, the Web and email networks, wherein the routing the one or more individual data structures in the POSvc Web application from said Web application over the service network on the Web performed as OSI application layer routing is object routing on the World Wide Web, distinct from routing at the transport layer of the OSI model or network layer of the OSI model or lower layers of the OSI model;

managing the connection between said real-time Web transaction request and the Web merchant's services from end-to-end in real-time; and

completing a real-time Web transaction from said Web application, wherein the online service is a loan Web application.

4. The method of claim 1, wherein said object in the Web application with said information entries and attributes in a real-time Web transaction is routed over the service network on the Web in the application layer of the OSI model as an encapsulated whole, wherein the object is the object identity specific to the Web application in the real-time Web transaction, and further wherein the encapsulated whole including the object identity with both information entries and attributes.

5. The apparatus of claim 2, wherein said value-added network service is a value-added network application on the Web, wherein the value-added network application resides at the transaction network entry point on the Web, and further wherein the value-added network application on the Web is a business banking Web application offered as a business banking on-line service on the Web, and wherein the business banking on-line service on the Web allows a real-time Web transaction from the value-added network application on the Web offered by a Web banking on-line service provider.

6. The apparatus of claim 2, providing real-time access from multi-media devices to any Web application specific to the Web merchant's services on the Web in a value-added service network on the Web to perform said real-time Web transactions from the Web application.

7. The apparatus of claim 2, wherein the value-added network service is a travel reservation Web application for completing real-time Web transactions on the service network on the Web.

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8. The apparatus of claim 2, wherein the value-added network service is an on-line banking Web application for the transfer of funds in real-time between accounts on the Web.

9. The apparatus of claim 2, wherein one or more participants interact with each other in any real-time Web transaction through any Web application on any device in a real-time exchange between a group selected from participants, devices, participants with devices, devices with devices, participants with applications, devices with applications, applications with applications and applications on any on-line service network atop the Web.

10. The apparatus of claim 2, utilizing a distributed control on the Web in the real-time Web transaction request, wherein the real-time Web transaction request is handed over to an Exchange, wherein the Exchange manages in real-time the connection between the real-time Web transaction request and any commercial service, wherein the commercial service is an online service operating across a digital network, wherein the digital network is a value-added service network atop the Web.

11. The apparatus of claim 2, utilizing an Internet communications device, wherein the Internet communications device is a cellular device accessing a Web application on a value-added service network atop the Web.

12. The apparatus of claim 2, wherein the object identity in the Web application in the real-time Web transaction is a networked object, wherein the networked object is an individual data structure connecting between a point-of-service Web application and a back-end application over an OSI Application layer network on the Web for completing real-time, bi-directional Web transactions, wherein the OSI application layer network on the Web is the service network running on top of the facilities network.

13. The apparatus of claim 2, wherein the a car rental Web application is offered as an on-line service on the Web by a Web merchant, and further wherein the car rental Web application is a value-added network application accessible in real-time on the Web.

14. The apparatus of claim 2, wherein the Web application is an insurance Web application offered as an on-line service on the Web by a financial services' company for performing real-time Web transactions to access and purchase insurance products.

15. The apparatus of claim 2, wherein the value-added network service is a commercial loan Web application.

16. The apparatus of claim 2, wherein said Web application is an Internet cloud application enabling a network of participants interacting in real-time with one or more Web applications through any real-time Web transaction.

17. The apparatus of claim 2, wherein the value-added network service is a retail banking Web application.

18. The apparatus of claim 2, wherein a real-time Web transaction is performed from a group selected from brokerage Web application, trading account Web application, mortgage banking Web application, commercial banking Web application, commercial real estate loan banking Web application, cash management Web application, credit card Web application, direct deposit Web application, commercial lending Web application, mutual funds and annuities Web application and any Internet cloud Web application.

19. The apparatus of claim 2, wherein a real-time Web transaction is performed from an asset and wealth management point-of-service Web application in an on-line Web banking service from a cellular device.

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